Proposal for a DØ Remote Analysis Model (DØRAM)

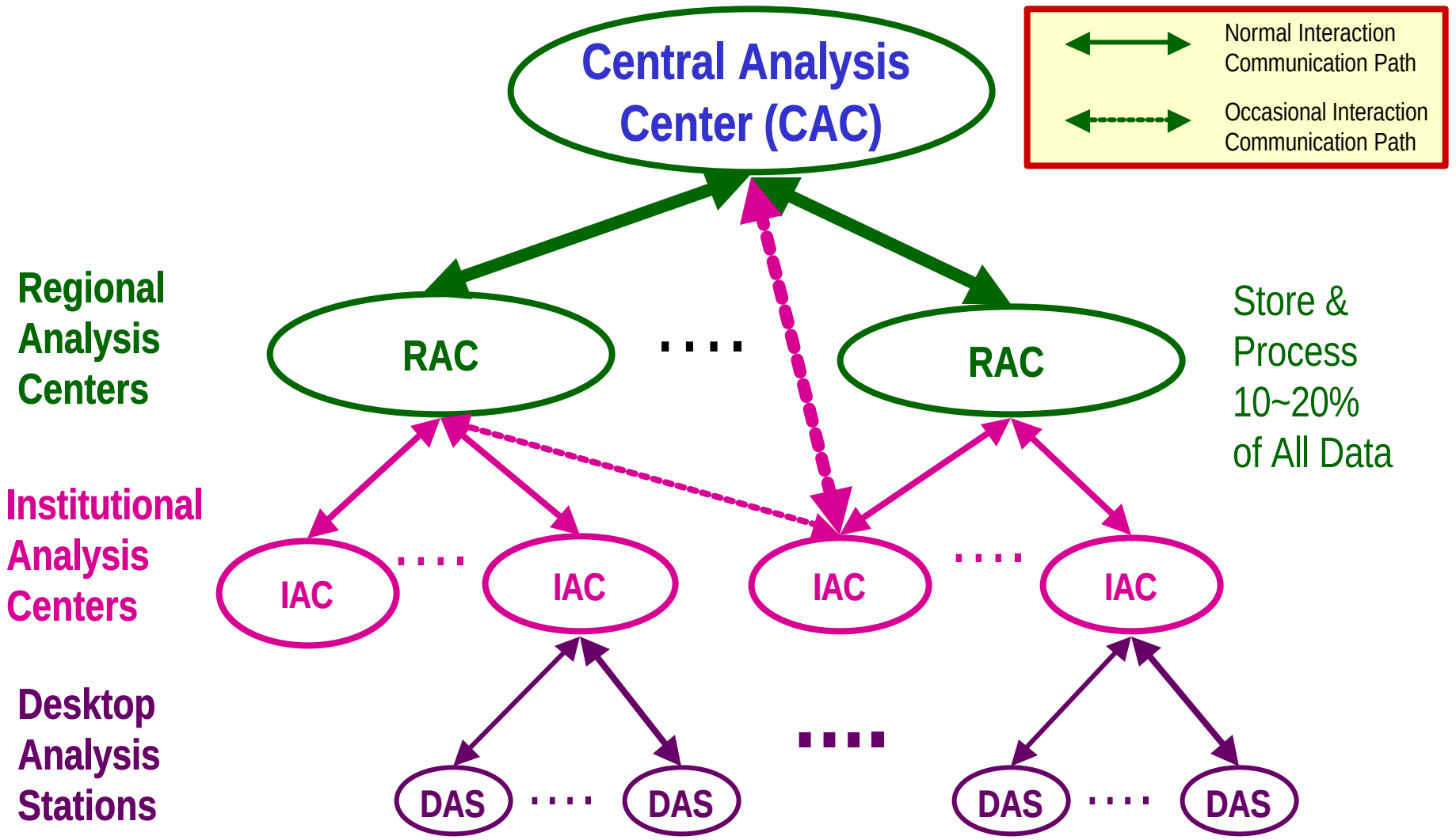
DØRACE Meeting
Dec. 20, 2001
Jae Yu

- Introduction
- Remote Analysis Station Architecture
- Requirement for Regional Analysis Centers
- Suggested Storage Equipment Design
- Conclusions

Why do we need a DØRAM?

- Total Run IIa data sizes are
  - 350TB for RAW
  - 200-400 TB for Reco + root
  - 1.4×10^9 Events total
    - At the fully optimized 10sec/event reco. $\Rightarrow$ 1.4×10^{10} Seconds for one time reprocessing
    - Takes one full year w/ 500 machines
  - Takes ~8mos to transfer raw data for dedicated gigabit network
- Centralized system will do a lot of good but not sufficient
- Need to allow remote locations to work on analysis efficiently
- Sociological benefits within the institutes
- Regional Analysis Centers should be established

Proposed DØRAM Architecture



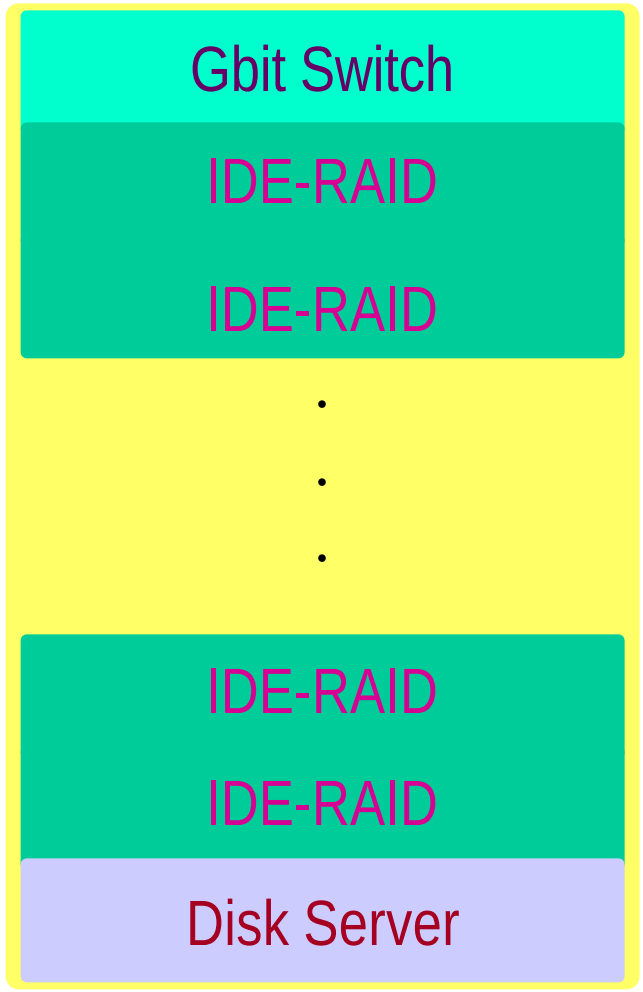
Regional Analysis Centers

- A few geographically selected sites that satisfy requirements
- Provide almost the same level of service as FNAL to a few institutional analysis centers
- Analyses carried out within the regional center
  - Keep 10~20% of statistically random data permanently
  - Most the analyses performed on these samples with the regional network
  - Refine the analyses using the smaller but unbiased data set
  - When the entire data set is needed ✍ Underlying Grid architecture provide access to remaining data set

Regional Analysis Center Requirements

- Become a Mini-CAC
- Sufficient computing infrastructure
  - Large bandwidth
  - Sufficient Storage Space to hold 10~20% of data permanently and expandable to accommodate data increase
    - >30TB just for Run IIa RAW data
  - Sufficient CPU resources to provide regional requests and reprocessing
- Geographically located to avoid unnecessary network traffic overlap
- Software Distribution and Support
  - Mirror copy of CVS database for synchronized update between RAC's and CAC
  - Keep the relevant copies of data bases
  - Act as SAM service station

Regional Storage Cache



- IDE Hard drives are $1.5~$2./Gb
- Each IDE RAID array gives ~1TByte – hot swappable
- Can be configured to have up to 10TB in a rack
- Modest server can manage the entire system
- Gbit network switch provide high throughput transfer to outside world
- Flexible and scalable system
- Need an efficient monitoring and error recovery system
- Communication to resource management

Conclusions

- DØ must prepare for large data set era
- Need to expedite analyses in timely fashion
- Need to distribute data set throughout the collaboration
- Establishing regional analysis centers will help
- Will write up a proposal for your perusal
- Would like to have a working group session for this issue at the workshop